<table>
<tr><th colspan="2">Louisiana Office of Public Health Laboratories</th></tr>
<tr><td>Test Name</td><td>Nerve Agents in Serum or Urine</td></tr>
<tr><td>PHL Location</td><td>Central Laboratory Chemical Terrorism Section</td></tr>
<tr><td>CPT Code</td><td>Y38.7X2A Civilian Injury
Y38.7X2D Subsequent Encounters</td></tr>
<tr><td>Synonyms</td><td>Nerve Agents; OPNA (OrganoPhosphorus Nerve Agents); VX, rVX (Russian VX), GB (Sarin), GD (soman), and GF (Cyclosarin). GA (Tabun) is not measured by this method.</td></tr>
<tr><td>Brief Description of Test</td><td>The nerve agents are synthetic organic compounds which have been around since the early 1900s. The first G agents, named in the order of their discovery, were made as pesticides. The second group of nerve agents, the V agents, are more potent than the G agents. GA was stockpiled by Nazi Germany, but never used. The first use of nerve agents on the battlefield was by Iraq in the Iran/Iraq war. Sarin has been used in terrorist attacks.

Nerve agents are powerful irreversible binders of acetylcholinesterase to prevent the enzymatic breakage of the acetyl choline bond, which inactivates normal nerve responses.

The OPNA method utilizes a solid phase extraction (SPE) on silica, reducing the aqueous percentage and the salt content from an aqueous mixture to a solvent composed of 95% acetonitrile. The sample is first prepared by evaporating it to dryness using azeotropic distillation with acetonitrile. Samples and standards, along with internal standards, are then extracted using the SPE prior to the LC/MS/MS analysis of OPNA metabolites in urine.</td></tr>
<tr><td>Possible Results</td><td>Each of the 5 nerve agents measured by this procedure in either urine or serum are reported as none detected or, if detected, in ng/mL</td></tr>
<tr><td>Reference Range</td><td>Reference ranges for tests in urine are:

<table><tr><th>Test</th><th>Normal Range</th></tr><tr><td>VX</td><td>None Detected</td></tr><tr><td>GB</td><td>None Detected</td></tr><tr><td>rVX</td><td>None Detected</td></tr><tr><td>GD</td><td>None Detected</td></tr><tr><td>GF</td><td>None Detected</td></tr></table>
Any level above None Detected will be treated as Critical (Panic) result and immediately phoned to the place of origin.</td></tr>
<tr><td>Specimen Type</td><td>Urine or Serum specimens are approved to be tested by this method.</td></tr>
</table>

<table>
<tr><td>Specimen Container(s):</td><td>Urine: Urine collected in a sterile, clean urine container, frozen immediately, and transported to the laboratory frozen on dry ice.

Serum: Serum collected in a red top tube without preservatives or anticoagulants, separated from the cells, and the serum frozen immediately. It should then be transported to the laboratory frozen on dry ice.</td></tr>
<tr><td>Minimum volume accepted:</td><td>Urine: at least 1 mL, but 10 mL is preferable.
Serum: at least 1 mL</td></tr>
<tr><td>Collection Instructions</td><td>Urine specimens should be collected from subjects in standard urine collection cups.
Serum specimens should be collected in a red top tube without preservatives or anticoagulants, separated from the cells, and the serum frozen immediately.

Notify the laboratory ahead of time about pending specimens.

Samples should be stored on dry ice for shipping and frozen as soon as possible. Special care must be taken in packing to protect the urine cups from breakage during shipment. All samples should be stored at -80 ± 10^0C until needed. The amount of specimen needed for this assay is 1000 uL. The sample aliquot collected should be at least 2.5-5 mL, allowing for repeat analyses, if necessary.

Specimen labels and Specimen containers must be labeled with at least 2 identifiers:
• Patient's name
• Unique identifier

Required information for specimen submission:
• Patient's name
• Unique identifier
• Date of birth/age
• Date and time of collection
• Initials of the person who collected the specimen
• Source of the specimen, (Serum)
• Submitter name, address, and contact number</td></tr>
<tr><td>Storage and Transport Instructions</td><td>
<table>
<tr><td>Analyte</td><td>Room Temp

(18º-28ºC)</td><td>Refrigerated

(2º-8ºC)</td><td>Frozen

(80ºC)</td></tr>
<tr><td>VX</td><td>Unacceptable</td><td>Unacceptable</td><td>Required</td></tr>
<tr><td>GB</td><td>Unacceptable</td><td>Unacceptable</td><td>Required</td></tr>
<tr><td>rVX</td><td>Unacceptable</td><td>Unacceptable</td><td>Required</td></tr>
<tr><td>GD</td><td>Unacceptable</td><td>Unacceptable</td><td>Required</td></tr>
<tr><td>GF</td><td>Unacceptable</td><td>Unacceptable</td><td>Required</td></tr>
</table>

Package in special thick-walled small volume OPH sytrofoam container and sandwich samples between dry ice. Ship rapidly so as to guarantee arrival at an acceptable temperature. Samples shipped frozen must be received at a temperature of -20°C or colder.</td></tr>
</table>

Causes for Rejection	Sample temperature upon arrival, QNS, transit damage, improper sample.
Limitations of the Procedure	All clinical chemistry results are subject to evaluation and interpretation by a medical professional. All aspects of the patient's history, symptoms, and other diagnostic testing must be considered along with the serum chemistry in actual patient monitoring and treatment. This testing is only a part of the entire picture.
Interfering Substances	The LC-MS/MS analyses for serum or urine nerve agents used in the OPH CT Lab provide excellent analytical specificity. The analyte peaks are located in well-defined regions of the chromatogram with no visible interferences and very low background. Although methods are used to minimize the possibility, it is possible that the sample matrix could cause ion suppression, resulting in lower than expected results. Occasional interference by unknown compounds might be encountered so false positive results are possible but very rare.
References	• Analysis of OPNA Metabolites in Urine by LC-MS/MS, Centers for Disease Control and Prevention, Chamblee, GA 30341 • Detection of OPNA Acids in Serum by HPLC-MS/MS, Centers for Disease Control and Prevention, Chamblee, GA 30341
Additional Information	None
Release Date	3/2016
Warning: If you have printed a copy of this information please be advised that the Louisiana Office of Public Health Laboratories website and methods are updated on a regular basis. Please check the on-line version of this document to ensure you are relying on the most recent release.	